ENTOMOLOGY.—*The bees of the genera* Augochlora, Augochloropsis, *and* Augochlorella (*Hymenoptera; Apoidea*) *occurring in the United States.*[1]

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This study of the brilliant, blue-green halictine bees of the genera *Augochlora, Augochloropsis,* and *Augochlorella* occurring in the United States was undertaken to facilitate their identification. The collections representing these genera in the United States National Museum have served as a basis for this revision and were supplemented by loans from other institutions and private collections.

I am greatly indebted to Mr. Robert B. Benson, of the British Museum, for comparison of specimens with the types of Smith's species; to Dr. C. R. Jones for information about the types in the collection of the Colorado Agricultural College; and to Messrs. Pierre-Georges Roy and Noel Comeau of the Musée de la Province de Quebec for comparisons of material with Provancher's types.

These genera may be separated by the following key:

1. First and second abdominal tergites each with apical fringe of simple bristles (if the fringe is worn off, an apical row of punctures visible); pubescence of tergites uniform and directed posteriorly; tegula large, metallic blue-green, caudal margin nearly truncate, inner margin emarginate; carinae on posterior-lateral angles of propodeum parallel, extending almost to dorsal surface. Female: Apical portion of labrum semicircular; posterior calcar of hind tibia pectinate. Male: Labrum with a median basal groove; first three abdominal segments more strongly developed than the others, the caudal segments usually partially retracted within the third; fourth sternite concealed under third, posterior-lateral angles extending into long processes, caudal margin with median projection, margin of fifth emarginate.. *Augochloropsis* Cockerell

   First and second abdominal tergites each without apical fringe of simple bristles, apical margins impunctate; tergites with long hairs directed posteriorly and short hairs laterally; tegula small, oval, brown or testaceous, usually without metallic tints; carinae on posterior-lateral angles of propodeum converging below, extending less than half way to dorsal surface. Female: Apical portion of labrum narrowly triangular; posterior calcar of hind tibia serrulate. Male: Labrum without a median basal groove; abdominal segments more uniformly developed, caudal segments not retracted; fourth sternite without posterior-lateral processes, caudal margin truncate or emarginate, margin of fifth usually truncate.. 2

2. Head broad, ocellocular line one and one-half times as long as postocellar; vertex gradually declivous behind postocellar line to the sharply defined occipital carina, the carina extending to hypostomal carinae;

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[1] Received December 28, 1936.

mesopleura punctate; metapleural suture carinate; apex of radial cell truncate, with appendiculate vein. Female: Mandible apically bidentate, the teeth subequal; first sternite usually with median carina or tooth, sixth with median triangular polished area; inner surface of hind femur with single row of long pinnately branched hairs. Male: Second flagellar joint distinctly longer than first; sides of propodeum deeply, nearly contiguously punctured; caudal margin of fourth sternite truncate .... *Augochlora* Smith

Head narrow, ocellocular line subequal to postocellar; vertex abruptly declivous behind postocellar line to the more weakly defined occipital carina, the carina obsolescent some distance from hypostomal carinae; mesopleura irregularly foveolate, indistinctly punctured; metapleural suture not carinate; apex of radial cell pointed. Female: Mandible with large rounded inferior tooth and smaller superior tooth separated by narrow emargination; first sternite without carina or tooth, sixth without triangular polished area; inner surface of hind femur with several rows of short unilaterally branched hairs. Male: First and second flagellar joints subequal; sides of propodeum indistinctly and rather sparsely punctured; caudal margin of fourth sternite usually emarginate .... *Augochlorella*, n. gen.

Augochlorella, n. gen.

Augochlora F. Smith, Cat. Hym. Brit. Mus., **1**: 73. 1853 (part).—Provancher, Natur. Canad., **13**: 205. 1882 (part).—Petit, Faun. Ent. Canad., p. 705, 1883 (part).—Robertson, Trans. Amer. Ent. Soc., **20**: 147. 1893 (part).—Dalla Torre, Cat. Hym., **10**: 93. 1896 (part).—Cockerell, Canad. Ent., **29**: 4. 1897 (part).—Robertson, Canad. Ent., **29**: 64. 1897 (part).—Cockerell, Trans. Amer. Ent. Soc., **24**: 162. 1897 (part).—Ashmead, Trans. Amer. Ent. Soc., **26**: 91. 1899 (part).—Cockerell, Proc. Acad. Nat. Sci. Phila., p. 374, 1900 (part).—Trans. Amer. Ent. Soc., **31**: 356. 1905 (part) (new synonymy).

Oxystoglossa Robertson, Canad. Ent., **34**: 244. 1902 (part) (new synonymy).

Halicti falcati groupe *Oxystoglossa* Vachal, Misc. Ent., **19**: 14. 1911 (part).

Genotype: Augochlora gratiosa Smith.

This genus is similar in general appearance and color to *Augochlora*, and the species assigned here were previously placed in that genus. The characters of the genus follow:

Head: In facial view nearly triangular, with angles rounded. Eyes large and bare, with their inner margins weakly emarginate, forming the lateral boundaries of the head for most of its length. Front slightly convex, contiguously punctured, occupying about half the space between anterior ocellus and apex of clypeus; a fine median carina on lower half. Vertex sparsely punctured, rather abruptly declivous to occipital carina. Postocellar line subequal to ocellocular. Occipital carina moderately well developed, obsolescent some distance from hypostomal carinae. Clypeus as broad as long in female, narrower in male, extending about half its length beyond lower margin of eye, apical margin truncate; clypeus and postclypeus strongly convex, with large punctures separated by more than their diameter; postclypeus shorter than clypeus. Basal portion of labrum of female broadly subrectangular, medially tumescent, apical portion narrowly triangular, medially sharply carinate, margins fringed with simple bristles. Labrum of male broadly subrectangular, convex, apical margin slightly curved and fringed, the bristles shorter than in the female. Gena obsolete.

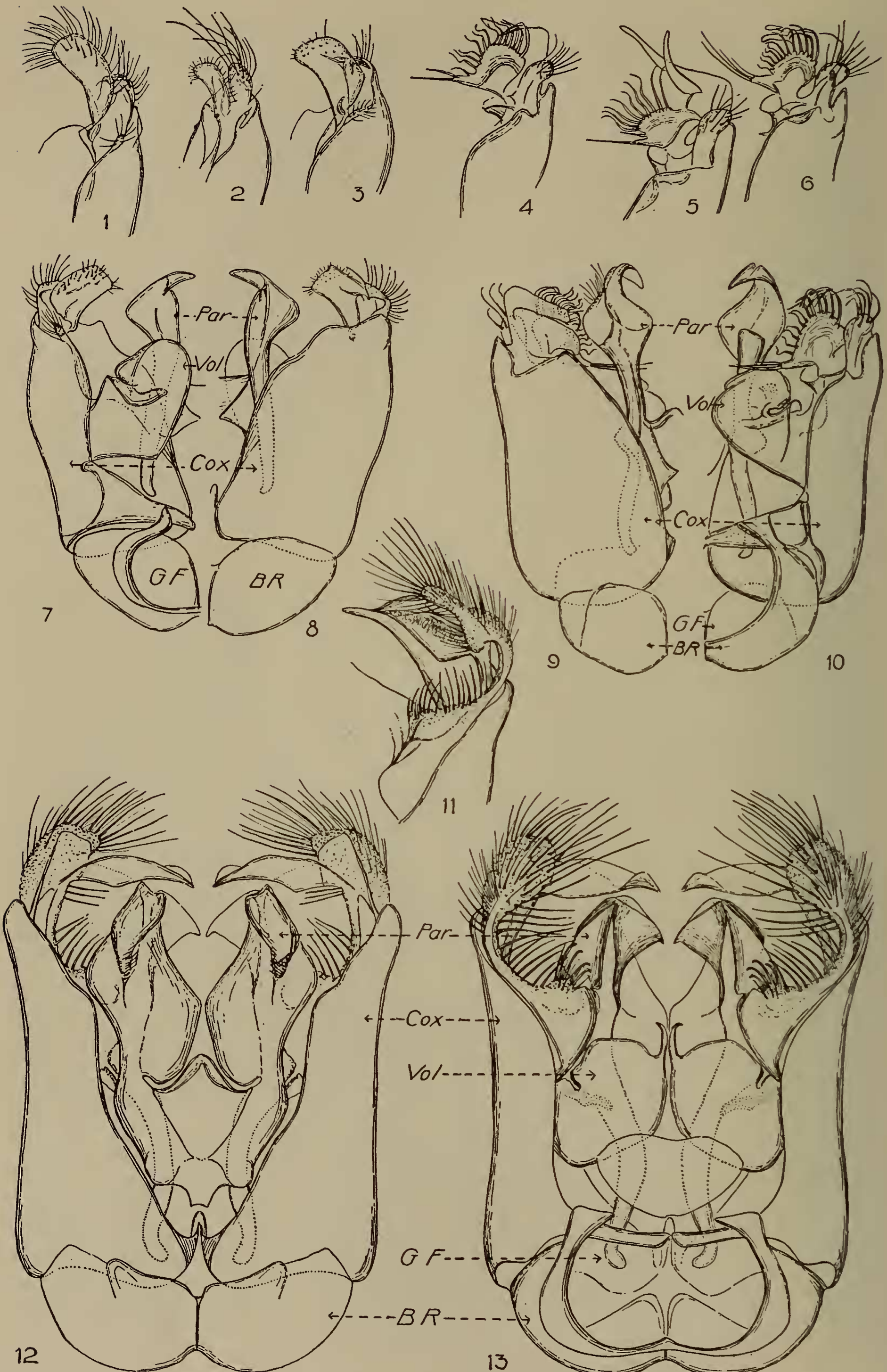
Post-gena declivous from outer margin of eye to occipital carina, striatopunctate above, finely tessellate and nearly impunctate below. Hypostomal carinae well developed, nearly parallel, without modifications. Mandible rather strongly curved; of female, with large rounded inferior tooth and smaller superior tooth separated by narrow emargination; of male edentate, tapering to pointed apex. Maxillary palpi six-jointed, labial palpi four-jointed. Antennae inserted about half way between apical margin of clypeus and postocellar line; scape of female about one-third length of antenna, flagellar joints progressively longer to apex; scape of male subequal to combined length of flagellar joints 4 to 6, joints 3 and 4 subequal, distal joints progressively longer.

General structure of thorax similar to that of related genera, more robust in female. Pronotum not modified. Mesoscutum broader than long, punctation usually varying specifically; parapsidal furrows as long as tegula, parallel; mesoscutellum nearly twice as long as metanotum, punctation similar to that of scutum. Mesopleuron, metanotum, and metapleuron irregularly foveolate-punctate. Propodeum extending horizontally for a short distance, then abruptly declivous to attachment of abdomen; dorsal surface or ''disk'' subcrescentic, the sculpture varying specifically; posterior-lateral angles carinate on lower third; posterior and lateral surfaces irregularly foveolate-punctate. Tegula small, oval, anteriorly with fine setiferous punctures.

Wings hyaline, yellowish infumate, veins brownish testaceous; venation of the usual type for the Halictinae; radial cell pointed at apex; second cubital cell higher than wide, always narrower in males. First recurrent nervure antefurcal or interstitial with second transverse cubital nervure. Legs typical for the subfamily and constant within the genus. Female: Inner surface of hind femur with several rows of short, unilaterally branched hair (similar to *Augochloropsis*); outer surface with long, pinnately branched hairs; knee-plate of hind tibia subovate, not so sharply defined as in *Augochlora;* inner tibial calcar serrulate. Male: Inner margin of hind basitarsus with fringe of hairs, which sometimes vary in length specifically.

Abdomen of female broadly ovate, of male more slender; tergites rather uniformly punctured except that the caudal margins are impunctate; shorter hairs directed laterally, longer ones posteriorly. Female: Fifth tergite with median rima, laterally densely pubescent; pygidial area of sixth narrow, sides parallel, apex truncate, apical-lateral angles rounded. Male: Sternites unmodified except the median emargination of caudal margin of fourth, which varies specifically.

Male genitalia: Basal ring cupuliform dorsally, much narrower ventrally and extending posteriorly as two processes which are attached to the bases of the coxopodites, instead of meeting medially. Coxopodites broad, shorter than the parameres, the distal ends with modifications which are constant for the species. On the ventral surface and near the distal end of the coxopodite is a flat, somewhat plate-like process, the caudal margin of which bears ribbon-like processes. Volsellae nearly flat, lying between the coxopodites distad of their ventral basal processes. Parameres narrow at bases, rather broadly expanded just before bending ventrally, apices pointed; on the ventral surface and just basad of the expanded portion is a slender projection with truncate apex. A figure of the entire genitalia of only one species (*gratiosa* (Smith)) is given and for the other species, a ventral view of the distal portion of the coxopodite, as that portion varies most between the species. (See Figs. 4, 5, 6, 9, 10.)



For explanation of Figs. 1–13, see bottom of opposite page.

Species brilliant blue-green, with sternites and legs largely brown; tarsi of male sometimes paler. Pubescence inconspicuous, white or yellowish.

KEY TO SPECIES OF THE UNITED STATES

1. Disk of propodeum carinate to caudal margin, median apical portion slightly depressed, median length subequal to that of metanotum, or slightly less, carinae longitudinal, radiating slightly. Mesoscutum anteriorly and laterally rugose-punctate..........................2
   Disk of propodeum not carinate to caudal margin, median apical portion not depressed, median length always distinctly greater than that of metanotum, carinae very irregular. Mesoscutum closely and uniformly punctured...3
2. Disk of propodeum with many fine, slightly irregular carinae. Male: Hairs at base of hind basitarsus distinctly more than half its length; caudal margin of fourth sternite with deep median emargination.... ....*gratiosa* (Smith)
   Disk of propodeum with few coarse, regular carinae. Male: Hairs at base of hind basitarsus distinctly less than half its length; caudal margin of fourth sternite with shallow median emargination............... ....*striata* (Provancher)
3. Tegula testaceous; caudal portion of disk of propodeum polished; caudal margins of abdominal tergites testaceous; species 5.5 to 6 mm long. Male: Caudal margin of fourth sternite with rather shallow median emargination; flagellum and tarsi testaceous; second flagellar joint hardly longer than first, shorter than third..........*aurata* (Smith)
   Tegula dark brown; caudal portion of disk of propodeum dull, microscopically tessellate; caudal margins of abdominal tergites narrowly margined with black; species 9 to 10 mm long. Male: Caudal margin of fourth sternite subtruncate; flagellum and tarsi dark brown; second flagellar joint distinctly longer than first, subequal to third........ ....*pomoniella* (Cockerell)

Augochlorella gratiosa (Smith), n. comb.

Augochlora gratiosa F. Smith, Cat. Hym. Brit. Mus., **1**: 80. 1853.—Dalla Torre, Cat. Hym., **10**: 95. 1896.

Augochlora austrina Robertson, Trans. Amer. Ent. Soc., **20**: 147. 1893.—Dalla Torre, Cat. Hym., **10**: 94. 1896 (new synonymy).

Fig. 1.—*Augochlora nigrocyanea* Cockerell. Distal portion of coxopodite, ventral view. Fig. 2.—*A. aztecula* Cockerell. Distal portion of coxopodite, ventral view. Fig. 3.—*A. transversalis* Sandhouse and Cockerell. Distal portion of coxopodite, ventral view. Fig. 4.—*Augochlorella striata* (Provancher). Distal portion of coxopodite, ventral view. Fig. 5.—*A. pomoniella* (Cockerell). Distal portion of coxopodite, ventral view. Fig. 6.—*A. aurata* (Smith). Distal portion of coxopodite, ventral view. Fig. 7.—*Augochlora pura* (Say). Male genitalia, ventral view of right half. Fig. 8.—*A. pura*. Male genitalia, dorsal view of right half. Fig. 9.—*Augochlorella gratiosa* (Smith). Male genitalia, dorsal view of left half. Fig. 10.—*A. gratiosa*. Male genitalia, ventral view of left half. Fig. 11.—*Augochloropsis cuprea* (Smith). Distal portion of coxopodite, ventral view. Fig. 12.—*A. caerulea* (Ashmead). Male genitalia, dorsal view. Fig. 13.—*A. caerulea*. Male genitalia, ventral view.

BR, Basal Ring; *GF*, Genital Foramen; *Cox.*, Coxopodite; *Vol.*, Volsella; *Par.*, Paramere. The illustrations were made by Mrs. Eleanor A. Carlin of the Bureau of Entomology and Plant Quarantine.

Augochlora festiva Graenicher (not Smith), Ann. Ent. Soc. Amer., **23**: 157. 1930 [erroneous determination].

Type: Female, from Georgia, in the British Museum, where it was compared with material submitted by the writer. The type of *austrina* is in Robertson's collection. The species can be distinguished by the characters of the disk of the propodeum and the hairs on the basitarsus of the male.

Distribution: Apparently limited to the southeastern part of the United States. Specimens have been seen from the following States: New Jersey, North Carolina, South Carolina, Georgia, Florida, and Alabama.

Augochlorella striata (Provancher), n. comb.

Augochlora striata Provancher, Addit. Faun. Canad. Hym., p. 317, 1888.—Dalla Torre, Cat. Hym., **10**: 96. 1896.

Augochlora pura Robertson (not Say), Trans. Amer. Ent. Soc., **20**: 146. 1893 [erroneous determination].

Augochlora matilda Robertson, Trans. Amer. Ent. Soc., **20**: 147. 1893.—Dalla Torre, Cat. Hym. **10**: 95. 1896 (new synonymy).

Augochlora confusa Robertson, Trans. Acad. Sci. St. Louis, **7**: 324. 1897 (new synonymy).

Oxystoglossa confusa (Robertson), Canad. Ent., **34**: 247. 1902.

Augochlora (*Augochlora*) *coloradensis* Titus, Canad. Ent., **33**: 133. 1901 (new synonymy).

Augochlora confusa coloradensis Cockerell, Ann. Mag. Nat. Hist., (7), **12**: 442. 1903.

Halictus asaphes Vachal, Misc. Ent., **19**: 49. 1911 (new synonymy).

Halictus (*Oxystoglossa*) *purus* Vachal, Misc. Ent., **19**: 50, 53, 111. 1911 (new synonymy).

Augochlora pseudopurella Strand, Archiv. Naturg., Abt. A., **80**: 163. 1914. (Proposed for *Halictus purus* Vachal, not Say) (new synonymy).

Halictus (*Oxystoglossa*) *confusus* Viereck, Conn. Geol. & Nat. Hist. Surv., **22**: 705. 1916.

Augochlora coloradensis Hicks, Canad. Ent., **63**: 176. 1931.

Types: Female and male, from Quebec, Canada, in the Musée de la Province de Quebec, where through the courtesy of M. Roy they were compared with material submitted by the writer. The types of *confusa* and *matilda* are in Robertson's collection. The type of *coloradensis* is in the collection of the Colorado Agricultural College. The female is sometimes rather difficult to separate from that of *gratiosa*, as the regularity of the carinae on the disk of the propodeum varies somewhat, but these are always much coarser in *striata;* the males are readily separated by the characters of the hind basitarsus and fourth sternite.

Distribution: United States east of the Rocky Mountains, from Maine to Florida and from South Dakota to New Mexico. Specimens have been seen from the following States: Maine, New Hampshire, Vermont, Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Maryland, District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, South Dakota, Nebraska, Kansas, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, Texas, Colorado, and New Mexico. The species is also known to occur in Ontario and Quebec, Canada.

Augochlorella aurata (Smith), n. comb.

Augochlora aurata F. Smith, Cat. Hym. Brit. Mus., **1**: 82. 1853.—Dalla Torre, Cat. Hym., **10**: 94. 1896.

Augochlora similis Robertson, Trans. Amer. Ent. Soc., **20**: 146. 1893.—Dalla Torre, Cat. Hym., **10**: 96. 1896 (new synonymy).

Augochlora confusa Cockerell (not Robertson), Bull. New Mex. Expt. Sta., **24**: 25. 1897 [erroneous determination].

Augochlora neglectula Cockerell, Bull. New Mex. Exp. Sta., **24**: 43. 1897 (new synonymy).

Oxystoglossa similis (Robertson), Canad. Ent., **34**: 247. 1902.

Halictus (*Augochlora*) *auratus* Viereck, Rept. New Jersey State Mus., p. 688, 1910.

Halictus (*Oxystoglossa*) *persimilis* Viereck, Rept. New Jersey State Mus., p. 688, 1910. (Proposed for *Halictus similis* (Robertson), not Smith) (new synonymy).

?*Halictus* (*Oxystoglossa*) *xystris* Vachal, Misc. Ent., **19**: 50. 1911 (new synonymy).

Type: Female, from St. John's Bluff, eastern Florida, in the British Museum, where it was compared with material submitted by the writer. The type of *similis* is in Robertson's collection. The type of *neglectula* is in Cockerell's collection; a "cotype" (paratype) is in the U. S. National Museum. The present location of the type of *xystris* is unknown to the writer. This species differs from *pomoniella* in size, color of tegulae and caudal margins of abdominal tergites, and sculpture of disk of propodeum.

Distribution: Apparently limited to the United States east of Rocky Mountains and south of the forty-second degree of latitude. Specimens have been seen from the following States: Maryland, Virginia, District of Columbia, North Carolina, Georgia, Florida, Indiana, Illinois, Minnesota, Iowa, Missouri, Kansas, Arkansas, Louisiana, Oklahoma, Texas, Colorado, and New Mexico.

Augochlorella pomoniella (Cockerell), n. comb.

Augochlora pomoniella Cockerell, Pomona Jour. Ent. & Zool., **7**: 232. 1915. —Pan-Pac. Ent., **3**: 162. 1927.

Type: Female, from Aliso Canyon, California, is in the U. S. National Museum. Of the species included in this genus, *pomoniella* approaches most nearly to *Augochlora* by the slightly wider head, dark caudal margins of the abdominal tergites, and shape of the fourth sternite of the male. It can be separated from *aurata* by the characters mentioned under that species.

Distribution: Apparently limited to the extreme southwestern part of the United States. Specimens have been seen from the following States: Arizona, Utah (southwestern part), and California (southern half).

Augochloropsis Cockerell

Augochlora (*Augochloropsis*) Cockerell, Canad. Ent., **29**: 4. 1897.—Proc. Acad. Nat. Sci. Phila., p. 374, 1900. *Genotype:* (*Augochloropsis subignita* Cockerell) = *Augochloropsis ignita* (Smith) (original designation).

Augochlora F. Smith, Cat. Hym. Brit. Mus., **1**: 73; pl. 3, fig. 10, 1853 (part). —Robertson, Trans. Amer. Ent. Soc., **20**: 147. 1893 (part).—Dalla Torre, Cat. Hym., **19**: 93. 1896 (part).—Robertson, Canad. Ent., **29**: 64. 1897 (part).—Cockerell, Trans. Amer. Ent. Soc., **24**: 162. 1897 (part).—Robertson, Canad. Ent., **29**: 176. 1897 (part).—Ashmead, Trans. Amer. Ent. Soc., **26**: 91. 1899 (part).—Robertson, Canad. Ent., **34**: 245. 1902.—Cockerell, Trans. Amer. Ent. Soc., **31**: 356. 1905 (part).

Halicti vibrissati groupe *Augochlora* Vachal, Misc. Ent., **11**: 126. 1903.—Misc. Ent., **19**: 13. 1911.

Augochloropsis (*Paraugochloropsis*) Schrottky. Zeit. Syst. Hym. Dipt., **6**: 312. 1906. *Genotype: Augochloropsis* (*Paraugochloropsis*) *lycorias* Schrottky (monobasic).

Tetrachlora Schrottky, Deut. Ent. Zeit., p. 481, 1909. *Genotype: Augochlora* (*Tetrachlora*) *multiplex* Vachal (monobasic).

Augochoropsis Schrottky, Deut. Ent. Zeit., p. 540, 1910.

This genus can be separated from the other genera of the Halictinae in the Nearctic fauna by the fringes of hair on the caudal margins of the first and second abdominal tergites (not to be confused with the preapical fasciae in *Halictus* s. str.) and by the large tegulae with truncate caudal margins. In general structure similar to *Augochlorella*, but differing in that the inner margins of the eyes are more deeply emarginate; labrum of female with basal portion broad, medially with longitudinal furrow, apical portion subsemicircular with high median carina, labrum of male with median furrow on basal portion; scape of male subequal to combined length of flagellar joints 3 to 6, fourth as wide as long, distal joints a little longer than wide. Pronotum laterally laminately produced, varying specifically. Posterior-lateral angles or propodeum with carinae extending nearly to caudal margin of disk. Female with knee-plate of hind tibia obsolete, inner calcar pectinate. Pubescence of abdominal tergites uniform and directed posteriorly; caudal margins of first and second tergites each with a single row of punctures and a fringe of coarse simple bristles; caudal segments of male usually retracted; posterior-lateral angles of fourth sternite produced into long processes.

Male genitalia: In general structure similar to those of *Augochlorella* but differing as follows: Volsella with slender process on inner caudal angle. Coxopodites longer than parameres, distal ends tapering and strongly convergent, ventral surface without a plate-like process. Apices of parameres broader. An illustration of the entire genitalia is given for *A. caerulea* (Ashm.), but for the others only a ventral view of the distal portion of the coxopodite, as that portion varies the most between the species. (See Figs. 11, 12, 13.)

Only two species are known to occur in the United States. They may be separated as follows:

Humeral angles of pronotum prominently developed, especially anteriorly; thoracic and abdominal tergites dull and microscopically tessellate between punctures; punctures on pleura and sides of propodeum contiguous; disk of propodeum dull, with fine irregular carinae; vertex elevated behind ocelli; postocellar line less than ocellocular; species usually 12 to 13 mm long; wings strongly infumated. Male: Fourth sternite with median caudal projection apically truncate, caudal margin of third truncate, of fifth with shallow emargination; tarsi dark brown .... *caerulea* (Ashmead)

Humeral angles of pronotum less prominently developed; thoracic and abdominal tergites shining between punctures; punctures on pleura and sides of propodeum separated by at least the diameter of a puncture; disk of propodeum shining, without carinae; vertex not elevated behind ocelli; postocellar line greater than ocellocular; species usually about 10 mm long; wings slightly infumated, yellowish. Male: Fourth sternite with median projection apically pointed, caudal margin of third broadly convex, of fifth with broad deep emargination; tarsi yellow.......... ....*cuprea* (Smith)

Augochloropsis ignita (Smith), n. comb.

Augochlora ignita F. Smith, Jour. Entom., **1**: 147. 1861.—Dall Torre, Cat. Hym., **10**: 95. 1896.
Augochlora subignita Cockerell, Trans. Amer. Ent. Soc., **24**: 145. 1897 (new synonymy).
Augochlora (*Augochloropsis*) *subignita* Cockerell, Canad. Ent., **29**: 145. 1897.
?*Augochlora fulvfimbriata* Friese, Stett. Ent. Zeit., **77**: 315. 1916, male only (new synonymy).

Type: Female, from Mexico, in the British Museum, where it was compared with specimens submitted by the writer. The type of *subignita* is in the Academy of Natural Sciences of Philadelphia; a paratype, in the U. S. National Museum. This synonymy is based on a study of material compared with the type of *ignita* and a part of the type series of *subignita*. The synonymy of *fulvofimbriata* which is tentatively suggested is based upon the study of a male specimen identified by Friese. Reference to *ignita*, which does not occur in the United States, is included only to give the synonymy of the genotype.

Augochloropsis caerulea (Ashmead)

Augochlora humeralis Patton, Bull. U. S. Geol. & Geogr. Surv., **5**: 365. 1879. —Dalla Torre, Cat. Hym., **10**: 95. 1896.—J. B. Smith, Jour. New York Ent. Soc., **9**: 52–72; text-figs. 1–3, pls. 3–5, 1901 (new synonymy).
Agapostemon caeruleus Ashmead, Bull. Colo. Biol. Assoc., **1**: 7. 1890.—Dalla Torre, Cat. Hym., **10**: 97. 1896.
Augochlora (*Augochloropsis*) *humeralis* Cockerell, Canad. Ent., **29**: 5. 1897.
Augochlora (*Augochloropsis*) *caerulea* Titus, Canad. Ent., **33**: 136. 1901.
Augochlora caerulea Crawford, Proc. Nebr. Acad. Sci., **7**: 165. 1901.
Halictus (*Augochlora*) *pattoni* Vachal, Misc. Ent., **11**: 132. 1903; **12**: 12. 1904. (Proposed for *Halictus* (*Augochlora*) *humeralis* Patton, not *Halictus humeralis* Sichel) (new synonymy).
Augochlora sumptuosa bolliana Cockerell, Ann. Mag. Nat. Hist., (8), **4**: 31. 1909 (new synonymy).
Halictus (*Augochlora*) *humeralis* Viereck, Rept. New Jersey State Museum, p. 688. 1901.
Augochlora lacustris Cockerell, Proc. U. S. N. M., **60** (18): 14. 1922 (new synonymy).
Augochlora floridica Cockerell, idem, 1922 (new synonymy).
Augochlora fulgida Graenicher, (not Smith), Ann. Ent. Soc. Amer., **23**: 157, 167. 1930 [erroneous determination].

Type: Male [not a female, as designated in the original description], labeled "Col." [although the type locality is cited as Denver, Colorado], in the U. S. National Museum. The types of *humeralis* are in the Academy of Natural Sciences of Philadelphia, where they were seen by the writer. The types of *sumptuosa bolliana*, *lacustris*, and *floridica* are in the U. S. National Museum, where they have been compared with *caerulea* and found to be identical. The name *humeralis* is a secondary homonym only in *Halictus*, but it has seemed best to follow the International Rules strictly in this matter. This species varies considerably in color, but is usually more bluish than *cuprea;* specimens from Florida are frequently deep purplish blue, as are also representatives of other species. In an account of the nesting habits (J. B. Smith, 1901) it is said to make deep and complicated burrows in the ground. It may be readily distinguished from *cuprea* by the characters given in the key, particularly the angles of the pronotum, the more strongly elevated vertex, and the brown tarsi of the male.

Distribution: Apparently limited to the southeastern and central parts of the United States, extending from New Jersey south to the tip of Florida and west to South Dakota and Texas. Specimens have been seen from the following States: New Jersey, Virginia, North Carolina, South Carolina, Georgia, Florida, Illinois, Minnesota, South Dakota, Nebraska, Kansas, Tennessee, Alabama, Mississippi, Texas, and Colorado.

Augochloropsis cuprea (Smith), n. comb.

Augochlora cuprea F. Smith, Cat. Hym. Brit. Mus., **1**: 79. 1853.—Dalla Torre, Cat. Hym., **10**: 94. 1896.—Graenicher, Ann. Ent. Soc. Amer., **23**: 157, 167. 1930.

Augochlora fulgida F. Smith, Cat. Hym. Brit. Mus., **1**: 79. 1853.—Dalla Torre, Cat. Hym., **10**: 95. 1896 (new synonymy).

Augochlora viridula F. Smith, Cat. Hym. Brit. Mus., **1**: 81. 1853.—Cresson, Trans. Amer. Ent. Soc., suppl. vol., p. 293, 1887.—Dalla Torre, Cat. Hym., **10**: 97. 1896.—Cockerell, Ann. Mag. Nat. Hist., (7), **19**: 533. 1907 (new synonymy).

Augochlora fervida F. Smith, Cat. Hym. Brit. Mus., **1**: 81. 1853.—Robertson, Trans. Amer. Ent. Soc., **22**: 118. 1895.—Dalla Torre, Cat. Hym., **10**: 95. 1896.—Robertson, Canad. Ent., **29**: 64. 1897.—Cockerell, Canad. Ent., **38**: 162. 1906. (new synonymy).

Augochlora lucidula F. Smith, Cat. Hym. Brit. Mus., **1**: 81. 1853.—Dalla Torre, Cat. Hym., **10**: 95. 1896 (new synonymy).

?*Augochlora sumptuosa* F. Smith, Cat. Hym. Brit. Mus., **1**: 82. 1853.—Dalla Torre, Cat. Hym., **10**: 96. 1896.—Cockerell, Canad. Ent., **29**: 5. 1897 (new synonymy).

Augochlora (*Augochloropsis*) *lucidula* Cockerell, Canad. Ent., **29**: 4. 1897.

Augochlora (*Augochloropsis*) *cleomis* Titus, Canad. Ent., **33**: 135; fig. 6, 1901 (new synonymy).

?*Halictus* (*Augochlora*) *chorisis* Vachal, Misc. Ent., **11**: 136. 1903; **12**: 13. 1904 (new synonymy).

?*Augochlora chorisis* Cockerell, Trans. Amer. Ent. Soc., **31**: 361. 1905.

Halictus (*Augochlora*) *cupreus* Viereck, Rept. New Jersey State Mus., p. 688, 1910.

Halictus (*Augochlora*) *fervidus* Viereck, Rept. New Jersey State Mus., p. 688, 1910.

Halictus (*Augochlora*) *viridissimus* Viereck, Rept. New Jersey State Mus., p. 688, 1910. (Proposed for *Halictus* (*Augochlora*) *viridulus* F. Smith, not *Halictus* (*Agapostemon*) *viridulus* Fabricius) (new synonymy).

Augochlora fulvofimbriata Friese, Stett. Ent. Zeit., **77**: 315. 1916, female only (new synonymy).

Augochlora anonyma Cockerell, Proc. U. S. N. M., **60** (18): 15. 1922 (new synonymy).

Augochlora (*Augochloropsis*) *fervida* Cockerell, Univ. Colo. Studies, **16**: 101. 1928.

Type: Female, from North America, in the Oxford Museum, where it was seen by Mr. Benson and its identity confirmed by comparison of specimens submitted by the writer. The types of *fulgida, viridula, fervida,* and *lucidula* are in the British Museum; their synonymy with *cuprea* was confirmed by comparisons in connection with notes and specimens submitted. The type of *sumptuosa* could not be located, but the synonymy tentatively made is based on a specimen in the British Museum identified by Smith. The type of *anonyma* is in the U. S. National Museum. The type and allotype of *cleomis* are in the collection of the Colorado Agricultural College, but the species can be identified with certainty from characters given in the description. A specimen of *fulvofimbriata,* labeled "typus" by Friese and in the National Museum, is identical with *cuprea.* The present location of the type of *chorisis* is unknown to the writer. This species varies in color in a manner similar to *caerulea* but is usually more golden green; it also differs in the angles of the pronotum, the less strongly elevated vertex, and the yellow tarsi of the male.

Distribution: In so far as is known, occurring throughout the eastern and central parts of the United States from New Hampshire to Florida and from South Dakota to Texas. It also occurs in Ontario, Canada, and the following Central American countries: Mexico, Honduras, Costa Rica, and Panama; but the distribution in these countries is yet inadequately known. Specimens have been examined from the following States: New Hampshire, Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Maryland, District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Ohio, Indiana, Illinois, Minnesota, Iowa, Missouri, South Dakota, Nebraska, Kansas, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, Texas, Colorado, and Arizona.

Augochlora F. Smith

Augochlora F. Smith, Cat. Hym. Brit. Mus., **1**: 73, pl. III, fig. 10, 1853 (part) —Jour. Entom., **1**: 146. 1861.—Provancher, Natur. Canad., **13**: 205. 1882.—Petite Faun. Ent. Canad., p. 705, 1883 (part).—Robertson, Trans. Amer. Ent. Soc., **20**: 147. 1893 (part).—Dalla Torre, Cat. Hym., **10**: 93. 1896 (part).—Cockerell, Canad. Ent., **29**: 4. 1897 (part).—Robertson, Canad. Ent., **29**: 64. 1897 (part).—Cockerell, Trans. Amer. Ent. Soc., **24**: 162. 1897 (part).—Robertson, Canad. Ent., **29**: 176. 1897 (part).—Ashmead, Trans. Amer. Ent. Soc., **26**: 91. 1899 (part).—Cockerell, Proc. Acad. Nat. Sci. Phila., p. 374, 1900 (part).—Trans. Amer. Ent. Soc., **31**: 356. 1905 (part). *Genotype: Augochlora pura* (Say). (By designation of Cockerell, Ann. Mag. Nat. Hist., (9), **11**: 448. 1923).

Oxystoglossa F. Smith, Cat. Hym. Brit. Mus., **1**: 83, pl. III, figs. 8–9, 1853. —Robertson, Canad. Ent., **34**: 244. 1902 (part).—Schrottky, Deut. Ent. Zeit., p. 482, 1909. *Genotype: Oxystoglossa decorata* Smith (monobasic).

Odontochlora Schrottky, Rev. Mus. La Plata, **16**: 14. 1909.—Deutsch. Ent. Zeit., p. 482, 1909. *Genotype: Augochlora muelleri* Cockerell (original designation) (new synonymy).

Halicti falcati, groupe *Oxystoglossa* Vachal, Misc. Ent., **19**: 14. 1911 (part).

The synonymy of *Oxystoglossa* was first proposed by Ashmead (1899), and although I was unable to examine the genotype, *decorata* Smith, Mr. Benson verified the presence of certain diagnostic characters and confirmed this synonymy. Through the designation by Cockerell of *pura* as the genotype of *Augochlora,* both *Oxystoglossa* and *Odontochlora* become direct synonyms and can no longer be used, even as subgenera.

This genus is similar to *Augochlorella* in general appearance and color, but differs as follows: Head broader, more gradually declivous to occipital carina, the carina strongly developed and continued to hypostomal carinae. Mandible of female apically bidentate, teeth subequal; inferior margin convex apically, varying specifically. Flagellum of male with joints beyond fourth progressively longer. Transverse suture of metapleuron carinate. Apex of radial cell truncate, with appendiculate vein. Lateral surfaces of propodeum deeply, contiguously punctured. Female: Inner surface of hind femur with a single row of long, curled, pinnately branched hairs (as in *Halictus*); first sternite usually with median carina or tooth, sixth with median triangular polished area. Male: First sternite with median furrow or carina, caudal margins of second to sixth truncate.

Male genitalia: In general structure similar to those of *Augochlorella*, but differing as follows: Coxopodites about as long as parameres. Distal portion of coxopodite with a subrectangular process which is directed medially, ventral surface without a plate-like process. An illustration of the entire genitalia is given for *A. pura* (Say), but for the others, only a ventral view of the distal portion of the coxopodite, as that portion varies the most between the species. (See Figs. 1, 2, 3, 7, 8).

KEY TO SPECIES OF THE UNITED STATES

1. Caudal margins of abdominal tergites black or tergites strongly melanic; wings somewhat fuscous, not at all yellowish; species bluish green, frequently with tendency to melanism also on head and thorax. Female: First sternite with median tooth; first tergite microscopically aciculate; mesoscutum anteriorly and laterally with contiguous punctures, posteriorly microscopically tessellate; median carina of labrum low, without basal notch. Male: Abdominal sternites 2 to 6 dull brown or black. 2

   Caudal margins of abdominal tergites brownish; wings yellowish infumate; species golden or yellowish green with no tendency to melanism. Female: First sternite with median longitudinal carina or furrow; first tergite polished; mesoscutum and mesopleuron shining; median carina of labrum apically strongly elevated, basally notched. Male: Third and fourth abdominal sternites shining, strongly tinged with green. . 4

2. Transverse carina of metapleural suture strongly produced into a lamelliform process. Female: Tooth on first sternite, from lateral view, tapering but slightly to broadly rounded apex. Male: Labrum and mandibles reddish brown; clypeus unicolorous; third flagellar joint longer than broad, one and one-half times as long as second; first tergite apically with sides parallel, then narrowed rather abruptly to base, caudal margin constricted, punctures distinct, separated by about their diameter. . . . . *transversalis* Sandhouse & Cockerell

   Transverse carina of metapleural suture not produced into a lamelliform process. Female: Tooth on first sternite, from lateral view, tapering to narrow apex. Male: Labrum and mandibles yellow; apical margin of clypeus yellow; third flagellar joint broader than long, subequal to second; first tergite narrowed gradually to base, caudal margin not constricted, punctures rather indistinct, separated by at least twice their diameter 3

3. Disk of propodeum longitudinally carinate. Female: First tergite indistinctly punctured; mesoscutum medially with some scattered punctures nearly twice as large as the others. Male: Third flagellar joint and those distad distinctly longer than wide, apical joint nearly twice as long as

wide; first sternite with low median carina; caudal margins of second and third slightly convex medially; first tergite finely aciculate; tarsal joints dark brown........................... *nigrocyanea* Cockerell

Disk of propodeum laterally with longitudinal, medially with very irregular carinae. Female: First tergite distinctly punctured; mesoscutum uniformly punctured. Male: Unknown.............. *azteca* (Vachal)

4. Mesoscutum finely, uniformly punctured, the punctures separated by more than their diameter, interspaces strongly polished; disk of propodeum laterally and basally with longitudinal carinae, median apical portion with carinae nearly transverse, extreme apex not carinate, polished. Female: Median carina of first sternite obsolescent; angle of hypostomal carina strongly produced; flagellum distinctly paler beneath. Male: Third flagellar joint subequal to fourth, the joints distad as wide as, or wider than long, except that the apical joint is distinctly longer; abdominal sternites obscurely tinged with green........... .... *aztecula* Cockerell

Mesoscutum more coarsely punctured, the punctures laterally nearly contiguous, medially separated by about their diameter, interspaces dull; disk of propodeum with slightly irregular longitudinal carinae reaching to apex. Female: Median carina of first sternite well developed; angle of hypostomal carina not produced; flagellum uniformly dark brown. Male: Third flagellar joint nearly one and one-half times as long as fourth, joints distad distinctly longer than wide; third and fourth abdominal sternites strongly tinged with green..... *pura* (Say)

Augochlora pura (Say)

Halictus purus Say, Boston Jour. Nat. Hist., **1**: 395. 1837.—Le Conte, Writ. Thomas Say, **2**: 773. 1859.

Augochlora pura F. Smith, Cat. Hym. Brit. Mus., **1**: 80. 1853.—Provancher, Natur. Canad., **13**: 206. 1882.—Faun. Ent., Canad., Hym., p. 706. 1883. —Dalla Torre, Cat. Hym., **10**: 96. 1896.—Robertson, Trans. Acad. Sci. St. Louis, **7**: 323. 1897.—Crawford, Proc. U. S. N. M., **45**: 243. 1913.—Blackman & Stage, Tech. Publ. 17, New York State Coll. For., Syracuse Univ., **24** (22): 198. 1924.—Graenicher, Ann. Ent. Soc. Amer., **23**: 157, 167. 1930.

Augochlora labrosa Robertson (not Say), Trans. Amer. Ent. Soc., **20**: 146. 1893.

Augochlora robertsoni Cockerell, Canad. Ent., **29**: 69. 1897.

Oxystoglossa pura Robertson, Canad. Ent., **34**: 246. 1902.

Augochlora banksiella (*pura* subsp. ?) Cockerell, Ann. Mag. Nat. Hist., (7), **19**: 533. 1907.

Halictus (*Oxystoglossa*) *purus* Viereck, Rept. New Jersey State Mus., p. 688, 1910.

Halictus (*Oxystoglossa*) *muelleri* Vachal, Misc. Ent., **19**: 45. 1911 (part) (new synonymy).

Halictus (*Oxystoglossa*) *astios* Vachal, Misc. Ent., **19**: 44. 1911.

Halictus (*Oxystoglossa*) *astios* var. (?) *fuscatipes* Vachal, Misc. Ent., **19**: 45. 1911 (new synonymy).

Augochlora mosieri Cockerell, Proc. U. S. N. M., **60** (18): 15. 1922 (new synonymy).

Augochlora palmarum Cockerell, idem, 1922 (new synonymy).

Types: Female and male, from the United States, probably destroyed, but the species can be placed with certainty from the description and the account of its habits. The type of *festiva* is in the British Museum, where it was compared with specimens of *pura* submitted by the writer. The types of *banksiella*, *mosieri*, and *palmarum* are in the U. S. National Museum and have been found to be identical with *pura*. The present location of the types of *astios* and its variety *fuscatipes* are unknown to the writer, but the characters given by Vachal definitely place them here. This species nests under the bark in decomposing sapwood of hickory and oak. It is the only species of the genus found in the United States outside of Texas. From other species of similar appearance the female may be readily distinguished by the median carina on the first sternite, the male by the strongly punctured sides of the propodeum and the truncate caudal margin of the fourth sternite.

Distribution: This species is distributed in the eastern and central parts of the United States from Massachusetts west to Minnesota and south to Texas and Florida. Specimens have been seen from the following States: Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Maryland, District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, Kansas, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, and Texas. It is also known to occur in Quebec and Ontario, Canada.

Augochlora aztecula Cockerell

Augochlora aztecula Cockerell, Ann. Mag. Nat. Hist., (7), **19**: 534. 1907.

Type: Female, from Tlacotalpam, Vera Cruz, Mexico, in Cockerell's collection. It can be separated from the other species of the genus occurring in the United States by the following: Apex of disk of propodeum polished; mesoscutum rather sparsely punctured, with interspaces strongly polished; carina of first sternite obsolescent in female; angle of hypostomal carina strongly produced.

Distribution: The only specimens taken in the United States that have been seen are from the region near Brownsville, Texas; the species apparently belongs to the Neotropical rather than to the Nearctic fauna.

Augochlora azteca (Vachal)

Halictus (*Oxystoglossa*) *azteca* Vachal, Misc. Ent., **19**: 45, 110. 1911.

Augochlora (*Odontochlora*) *azteca* Cockerell, Proc. U. S. N. M., **63** (8): 4. 1924.

Type: Female, from Mexico, is probably in the Musée National d'Histoire Naturelle, Paris. The female may be distinguished from *pura* and *aztecula* by the tooth on the first sternite and the black caudal margins of the tergites, from *transversalis* by the weaker carina on metapleural suture, and from *nigrocyanea* by the punctation of the tergites and the differences in the carinae on the disk of the propodeum.

Distribution: Apparently similar to that of *aztecula*. Reference to the occurrence of *azteca* in Lower California by Sandhouse and Cockerell (1924) was erroneous; the specimens mentioned there belong to *transversalis*.

Augochlora transversalis Sandhouse & Cockerell, new status

Augochlora azteca var. *transversalis* Sandhouse & Cockerell, Proc. Calif. Acad. Sci., (4). **13**: 338. 1924.

Augochlora azteca Sandhouse & Cockerell (not Vachal), Proc. Calif. Acad. Sci., (4), **13**: 339. 1924 [erroneous determination].

Type: Female, from La Paz, Lower California, is in the Museum of the California Academy of Sciences. In both sexes it can be readily separated from the other species of the genus by the lamelliform process on the metapleural suture.

Distribution: Although apparently limited to Lower California, the species is included here in order to show its relationship to *azteca* and to correct the distributional records for that species.

Augochlora nigrocyanea Cockerell

Augochlora nigrocyanea Cockerell, Trans. Amer. Ent. Soc., **24**: 144. 1897.

Augochlora (Odontochlora) nigrocyanea Schwarz, Amer. Mus. Novit., **722**: 6. 1934.

Type: Female, from San Rafael, Vera Cruz, Mexico, in the collection of the U. S. National Museum. It can be separated from the other species occurring in the United States by the following characters: From *transversalis* by the weaker carina on the metapleural suture, from *azteca* by the greater tendency to melanism and the more weakly punctured abdominal tergites; the female, from those of *pura* and *aztecula* by the toothed first sternite; the male, from *pura* by the dark abdominal sternites and from *azteca* and *aztecula* by the larger size and more slender flagellum.

Distribution: Apparently similar to that of *aztecula.*

SPECIES NOT RECOGNIZED

Augochlora obliqua Provancher

Type: Female, from Vancouver, in the Musée de la Province de Quebec. Upon comparison by M. Comeau with material submitted by the writer, it could not be recognized as belonging to any of the known species of the genera considered in this paper; nor are these known to occur in that region. It may be referable to *Agapostemon,* but further information on the type is necessary before a definite assignment can be made.

MALACOLOGY.—*A new species of* Melania *from Szechuan Province, China.*[1] Sui Fong Chen. (Communicated by Paul Bartsch.)

In a collection of Chinese fresh water mollusks received by the U. S. National Museum from the Rev. D. C. Graham is an undescribed species which is here named.

I wish here to express my appreciation to the authorities of the U. S. National Museum and to Dr. Paul Bartsch, the Curator of the Division of Mollusks, for the privilege of studying the Chinese Melanias in their collection.

Melania (Plotiopsis) grahami, n. sp. Figs. 1–7

Shell thin, elongated, ovate, turreted, greenish yellow with more or less irregularly interrupted reddish brown axial bands which are most conspicu-

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